



November 11, 1999

Ms. Magalie Roman Salas, Secretary  
Federal Communications Commission  
The Portals, TW-A325  
445 12<sup>th</sup> Street, S.W.  
Washington, D.C. 20554

Re: Ex Parte Notification – WT Docket No. 99-168

Dear Ms. Salas:

This letter is being filed on behalf of Motorola, Inc. (Motorola). As part of this proceeding, Motorola has proposed a band plan for the disposition of the spectrum at issue. FreeSpace Communications has also filed a band plan for the use of this spectrum. Motorola takes this opportunity to address some of the elements of the FreeSpace plan.

Please contact Leigh Chinitz at (202) 371-6940 regarding any questions concerning this matter.

Respectfully Submitted,

---

Leigh M. Chinitz  
Motorola, Inc.

Attachment

cc:

Ari Fitzgerald

Mark Schneider

Peter Tenhula

Bryan Tramont

Adam Krinsky

Thomas Sugrue

James Schlichting

Diane Cornell

Dale Hatfield

Robert Pepper

Kathleen O'Brien Ham

Gary Michaels

Robert Calaff

Stanley Wiggins

Thomas Stanley

Julius Knapp

Michael Wilhelm

## **I. Introduction**

As part of the FCC's proceeding to determine service rules for the use of the 36 MHz of commercial use spectrum in the 746-806 MHz band, Motorola has proposed a band plan (identifying CMRS and PMRS allocations, for the sake of simplicity herein termed the "PMRS plan") for the use of that spectrum. The PMRS plan, we feel, fairly addresses the requirements of three market segments: Public Safety, consumer-oriented carriers, and private mobile radio services. This plan clearly has both technical aspects and policy aspects. Technically it is founded on the concept of making the most efficient use of the 36 MHz of spectrum while providing the necessary interference protection to the previously allocated 24 MHz of Public Safety spectrum with which the commercial use spectrum is intertwined. From a policy point of view this plan addresses the well-documented need of the PMRS community for additional spectrum, and incorporates the view that the increased market for equipment created by adjacent Public Safety and PMRS allocations is in the national interest.

Another party, FreeSpace, has come forward to propose a plan that, while similar in physical structure to the PMRS plan, is different in several ways. While Motorola has not yet commented publicly on this plan, we are concerned about an element of the current debate, and we wish to address that here. When explaining the rationale behind its proposed plan, FreeSpace also claims a desire to protect the Public Safety spectrum, and they claim that due to the low power spectral densities proposed for elements of its plan, that protection will be achieved. While the policy aspects of the PMRS plan and the FreeSpace plan are open to debate, the technical aspects must be given much less latitude. The simple declaration made by FreeSpace that they will protect the Public Safety community appears to have been accepted as a fact in this debate. Motorola, on the other hand, can find no evidence entered into the record of this proceeding that can be used to verify such a claim. To be clear, the following critical points do not appear to us to have been addressed.

### **A. Out of band emissions**

The PMRS plan requires that the equipment in the PMRS band meet the same emissions standards as the Public Safety equipment, and that the Public Safety and PMRS use be frequency coordinated. In such a situation, the interface between the Public Safety and PMRS allocations becomes irrelevant from an interference point of view. It is as though the two allocations were one. The only interface of importance is that at the edge of the consumer-oriented carrier band. The PMRS plan then requires that emissions from these carriers be at the level of -57 dBm in the first channel of the Public Safety band.

The FreeSpace plan, on the other hand, appears to assume that since the power spectral densities of the FreeSpace equipment are low, Public Safety operation will automatically be protected. However, the critical interface has now moved to the edge of the Public Safety band. The lowest power levels proposed by FreeSpace are 4mW/kHz. If this same level of emission occurs in the first channel of the Public Safety band, it would be 25 mW ( $25\text{mW} = 4\text{mW/kHz} \times 6.25\text{ kHz}$ ), or 14 dBm. To achieve a level of -57 dBm in this channel so as not to interfere with Public Safety, the FreeSpace equipment would need to be reduced by 71 dB in the first adjacent channel, an extremely aggressive level. To date we have seen no evidence that the equipment proposed by

FreeSpace can meet such a level. In addition, as we will discuss in the next point, even this is not sufficient to guarantee protection to Public Safety.

## **B. Site Isolation**

Site isolation is the loss between the input of the transmit antenna and the output of the receive antenna. In the PMRS plan we have proposed that the consumer-oriented equipment (interferer) provide emissions of no more than  $-57$  dBm in the first 6.25 kHz channel of the Public Safety equipment (victim). We believe that this protects Public Safety because the expected physical separation between the interfering base stations and the victim mobile receivers will allow the interfering signal to be reduced by a certain amount (site isolation.) Based on field measurements, that amount is about 75 dB.

In the FreeSpace plan, however, the use of low power spectral densities is used to provide the Public Safety protection. A simple analysis of this claim follows. Assume that a 100 Watt CDMA CMRS site and a FreeSpace site use the same antenna heights, antenna gains, and receiver sensitivities so that we have the same path loss except for a 14 dB difference in power (20 dBW for CDMA and 6 dBW for FreeSpace.) This reduction in power results in coverage radii for FreeSpace sites that are about one half the radii of the CDMA sites. This means it will take about four times as many FreeSpace sites to cover the same area as CDMA sites. In the PMRS plan, the 1.5 MHz of spectrum separating the consumer-oriented systems from the Public Safety systems means that the interference zone around a CMRS site will be of about 500 ft in radius. By their own analysis, FreeSpace anticipates 170m (or 550 ft) interference zones around their sites. This implies that, in fact, there will be four times more interference to Public Safety caused by FreeSpace than by CMRS using the PMRS plan.

The potential interference scenarios only get worse. If FreeSpace uses lower antenna heights, they will use even more sites, resulting in even more interference holes in PS coverage. Without frequency coordination across the band edge, it will not be known where the holes are. In the PMRS plan, frequency coordination makes it possible to know where the holes could occur, and design systems to prevent them.

Finally, the FreeSpace plan implies situations that are even potentially more damaging than those described above. FreeSpace claims that they will not have sites close to Public Safety sites. If we assume that a FreeSpace system would have indoor antennas, perhaps even multiple indoor antennas due to the short range inside buildings, then we must deal with a very real worst-case near-far situation. That would occur at the 764 MHz interface. Each FreeSpace fixed (base) transmitter would create an interference zone around its location. The Public Safety receiver would be trying to receive a desired signal from a station transmitting at a frequency slightly above 764 MHz. If this is an indoor situation, the Public Safety desired signal would be attenuated by the building penetration loss while the interfering source would be very close and, probably, continuously transmitting so as to provide mobility management. Subscriber units may have power control, but base transmitters do not as this would make mobility management much more difficult. This would create fairly large dead zones near FreeSpace emitters.

### **C. Modulation**

Even the Public Safety equipment being designed for use in this band cannot meet the strict interference protection requirement of  $-57$  dBm in the adjacent 6.25 kHz channel. This is not a problem because frequency coordination between physically nearby users will prevent inappropriate channels from being used. This same frequency coordination process is what makes it possible for the PMRS users in the band adjacent to Public Safety to protect those operations. In addition, radios in the PMRS band would have the same technical parameters as radios use in the Public Safety band.

In the FreeSpace plan, however, it is not clear whether or not frequency coordination is even an option. Assuming that the FreeSpace equipment cannot guarantee that it will deposit no more than  $-132$  dBm into the first 6.25 kHz channel of the Public Safety allocation ( $-57$  dBm of emissions plus 75 dB of site isolation), it must be asked whether or not the operators of FreeSpace equipment would be willing to coordinate with Public Safety operations and, if willing, whether or not the FreeSpace equipment allows this. If PMRS equipment with a 6.25 kHz bandwidth were used in the 1.5 MHz PMRS band, there would be 240 communications channels. Even with wider bandwidth technologies there are clearly enough channels so that coordinators can make judicious use of the spectrum to avoid interference. However, if the FreeSpace equipment uses spread spectrum technology, for example, there is no opportunity to employ frequency coordination. If the entire 2 MHz (in the FreeSpace plan) were used by a single spread channel, any nearby Public Safety operations in the adjacent channel would receive interference, and the operator of the FreeSpace technology would have no ability to move his operations to a different channel.

## **II. Conclusion**

These are only some of the many issues which need to be addressed when making the claim that a given band plan will adequately protect nearby Public Safety operations. To our knowledge, the details necessary to make that claim have not been placed into the record of this proceeding.

It is still possible to make policy decisions on the use of this spectrum even in the face of such uncertainty. Many of the goals of the FreeSpace proposal are laudable ones, and it is understandable that the FCC would want to accommodate a new technology that might be able to accomplish those goals. For example, FreeSpace believes that it can provide a broadband wireless voice and data service, and that it can extend wireless and Internet services to underserved areas. Given the existing uncertainty due to the Public Safety interference question, it is reasonable to ask whether this particular spectrum is the correct place to be trying out a new and untested technology, even if the goals are worthy ones. For example, given the low power limits for some of the FreeSpace plan, it seems appropriate to ask whether the unlicensed bands can be used to provide the same service. Metricom's Ricochet service is an existing example of the successful provision of data and Internet services in an unlicensed band. The FCC has made a great deal of unlicensed spectrum available in which new technologies can be tested in an environment in which interference protection is much less of an issue. On the other hand, if FreeSpace believes that it has a technology which will allow it to offer wireless access to underserved populations (probably in the parts of its band plan allowing for  $>20$  mW/kHz power

spectral densities) it seems reasonable to ask why disaggregation of spectrum from an existing cellular or PCS license holder is not an option. That these areas are underserved implies that those carriers are not using the spectrum in those regions.

It is not Motorola's intention in this proceeding or in any other proceeding to denigrate the technology of another manufacturer. However, we want to emphasize strongly that we do not believe that enough evidence exists to conclude that FreeSpace can protect Public Safety operations. We strongly disagree with the suggestion that, from the point of view of protection to Public Safety operations, the PMRS plan and the FreeSpace plan are equivalent. Since the situation is so uncertain, we believe that the correct policy question to ask is whether or not the 700 MHz band is the appropriate one in which to deploy this new technology, especially given the other viable alternatives.